



**State of Utah**  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

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September 19, 1995

R. E. Dunne  
Project Manager  
Kennecott Utah Copper  
P.O. Box 352  
Bingham Canyon, Utah 84006

Re: Second Review of Notice of Intention to Commence Large Mining Operations, Kennecott Utah Copper, Tailings Modernization Project/North Impoundment, M/035/015, Salt Lake County, Utah

Dear Mr. Dunne:

The Division has reviewed the following documents which have been submitted for the Tailings Modernization Project/North Impoundment:

1. "Summary Report - Gypstack Characterization" by Shepherd Miller, Inc., received 5/18/95
2. "Acidification Potential of the Kennecott Tailings, Final Report" by Shepherd Miller, Inc. and Schafer and Associates, received 5/23/95
3. "Tailings Modernization Project, DOGM Supplement," received 5/4/95.

After reviewing this information, the Division has the following comments which will need to be addressed. The comments are listed below under the applicable Minerals Rule heading. Please format your response in a similar fashion. The Division has drafted separate comments-dealing more specifically with documents 1 and 2 above. We wish to reserve these draft comments until after the Acidification Training Session proposed for September 25, 1995. We anticipate that a number of these draft comments may be addressed through this training session.

**R647-4-105 - Maps, Drawings & Photographs**

**105.3 Drawings or Cross Sections (slopes, roads, pads, etc.)  
Section 3.15.**

Please supply a detailed watershed map and the watershed area calculations used to determine the peak flow rates used to size/design the culverts, canals and ditches to be constructed with this project expansion. Many reports regarding surface water drainage have been generated and it appears



that only pieces of this analysis has been submitted to the Division. It is important that the Division have the design calculations for all ditches, culverts, and ponds in order to review the capacity of structures. (TM)

#### **R647-4-106 - Operation Plan**

##### **106.8 Depth to groundwater, extent of overburden, geology**

The review of groundwater and analysis of potential impacts to groundwater has been ongoing with the Department of Environmental Quality, Division of Water Quality, and the outcome of this review has been the "Draft Ground Water Discharge Permit and Statement of Basis For Kennecott Tailings Impoundment; Proposed Ground Water Discharge Permit No. UGW350011". Further review of ground water issues and impacts will be coordinated with the Division of Water Quality. (TM)

#### **R647-4-107 - Operation Practices**

##### **107.3 Erosion control & sediment control**

1. What curve numbers were used for the hydrologic calculations and how were they justified? If this information has been submitted to the Division, please provide a reference and date of submittal. (TM)

2. Culverts inlets and outlets are protected with riprap for 2 culvert lengths upstream and 4 culvert lengths downstream. No mention of specific culvert locations and specific sizes of riprap was discussed; is this information available? The only mention of riprap is that existing Kennecott material stockpiles will be used, riprap will be 2 times the D50 (median rock size by weight) and granular bedding will be used beneath riprap. How will the median rock size be chosen, how thick and what size will the granular bedding be? This information could be submitted in a detailing sizing chart referencing culvert location, size, contributing watershed area, peak flow, inlet and outlet flow velocities, etc. (TM)

#### **R647-4-109 - Impact Assessment**

##### **109.1 Impacts to surface & groundwater systems**

An increase of the drainage area for the Lee Creek Channel from 7 square miles to 80 square miles has raised the question of flooding adjacent to the Lee Creek channel alignment. A drainage map showing the resulting final drainage area contributing to Lee Creek would be appropriate. If a detailed discussion of the potential impacts from flooding has been included in these submittals, please provide a reference and date of submittal. (TM)

#### **109.5 Actions to mitigate any impacts**

Acid generation in the new tailings impoundment and how 20 week duration humidity cell tests were taken as the standard to determine acid generating potential long term. Why not longer, like 52 week, 100 week, 200 week, etc.? Kennecott stated that acid was still being generated but was substantially reduced after 20 weeks. What does this mean and how does this test relate to the actual conditions of the tailings impoundment?

The acidification report projects that acidification of the impoundment tailings will occur on 25-35% of the existing embankment. It has been stated that treatment with lime and other soil amendments should take care of this. Please describe where these treatments have been used/observed elsewhere to date and the long term success of these treatment methods. (TM)

#### **R647-4-110 - Reclamation Plan**

#### **110.4 Description or treatment/disposition of deleterious or acid forming material**

A major concern, or unknown with this plan is long term effects, which may or may not manifest themselves until years after decommissioning of the tailings pond. Short term, Kennecott has demonstrated that vegetation can be established and maintained for several years (what would be our normal liability period). However, the unknown of the long term effects of acidification are haunting. Current revegetation efforts on the existing tailings (embankments and step-back areas) show favorable results. The concern comes when Kennecott stops adding water to the pond. Will the rate of acid generation increase as the tailings begin to dry out? Will acid migrate to the surface and affect the established vegetation? Or, will it continue to move downward, and if so, is the buffering capacity of the underlying clays sufficient to neutralize effluent before it leaves the area (reaches the Great Salt Lake)? It will take several years to resolve these questions. The Division proposes the following be implemented as part of any long term monitoring program:

1. Continue to monitor toe drains for increased acidity for as long as any discharge is produced.
2. Develop a testing plan to determine if there is any upward (or lateral) migration of acids.
3. Locate monitoring wells down gradient to determine acid migration and/or adequacy of buffering capability of underlying material.
4. Using existing wells, piezometers, etc., determine if the rate of acidification increases as the existing tailings are decommissioned and begin to dry out.
5. Monitor any effects on existing vegetation that may be a result of acidification, especially the deeper rooted species such as poplars, salt cedar, and alfalfa.

Answers to these questions may be several years away. If negative impacts occur, mitigation would be required. Potential mitigation may include (but is not limited to): capping the pond at a later date, supplemental post-mining irrigation, or adding/injecting neutralizing agents. (LMK)

**R647-4-110.4 Reclamation Plan**

The Draft Report - Acidification Potential of Kennecott Tailings, *Overall Acid Generation Risk*, xii-xiii (and Final Acidification Report - Conclusions, Section 8-4, item 11) discusses the likelihood that upon closure, "patches" of surficial acidification will develop, similar to the existing impoundment, along the embankment of the North Expansion Impoundment. The reports state that alternative closure methods that may minimize acid generation risk are currently being evaluated in the cyclone test fill areas. Please describe the alternative closure methods being tested and if preliminary results are available? (DWH)

**R647-4-112 - Variance**

**R647-4-111.13.11 Variance Request - 70% Revegetation Standard (pg. 24-25)**

Kennecott has indicated in their response to this variance request that the ultimate goal of the tailings revegetation at the Kennecott site is to establish a plant community that is productive, self-sustaining, and effective in controlling wind and water erosion. Kennecott proposes an overall 25% vegetative cover reclamation success standard for the tailings impoundment, based upon an evaluation of the existing revegetative efforts conducted on the impoundment. The Division acknowledges that this success standard will likely exceed the premining undisturbed natural vegetation coverage. However, given the nature of the unnatural placement of the highly erodible tailings material in this location, will a 25% revegetation success standard be sufficient to achieve Kennecott's ultimate goal of a productive, self-sustaining plant community that will be effective in controlling wind and water erosion? The Division will accept the 25% standard, but reserves the right to increase the standard (or require other suitable mitigative measures), if Kennecott cannot demonstrate, through continued reclamation/revegetation efforts on the impoundment, that the 25% cover standard will achieve long-term environmental stability of the impoundment. (DWH)

**R647-4-113 - Surety**

Thank you for the additional information describing/supporting the line items in the surety estimate. This information has satisfied a majority of our concerns; however, a few items require additional information. Please provide additional information to support the following items as listed in the recent submission:

Removal of buildings, pumphouses, etc.	1 lot	\$265,250
Removal of roads not required for reclamation	1 lot	\$334,215
Piping removal	1 lot	\$1,105,562
Removal of all utilities	1 lot	\$1,591,500.

Page 5  
R. E. Dunne  
M/035/015  
September 19, 1995

The additional information would include: a listing of the buildings, type of construction (wood, concrete, metal, reinforced concrete, combination, etc.), square footage or volume for each building; acreage of roads; length of piping; and description of utilities to be removed. (AAG)

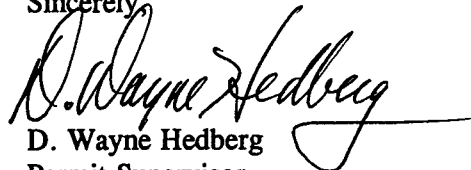
The escalation factor of 2.01% was the current factor at the time of the initial submission. The current escalation factor now is 2.68%. Please use the new escalation factor of 2.68% in the surety calculations. (AAG)

The reclamation plan proposed thus far does not specifically include monitoring of the impoundment after the reclamation work has been performed, but prior to reclamation release. At this time, the Division is aware of some monitoring requirements associated with the groundwater permit currently being developed with the Division of Water Quality. In order to avoid duplication of efforts, we suggest waiting until the water quality permit is finalized before attempting to further define monitoring of the impoundment which will be included in the reclamation cost estimate.

The reclamation plan does not include surface treatment/application of soil amendments to acidic hot spots which may develop on the proposed embankment, although this is mentioned as a method of dealing with this circumstance. It is likely that some type of soil amendment will be needed to improve the soil characteristics in order to enhance revegetation success and reduce the acidification potential. At this time, we feel we have insufficient information to decide whether this treatment, or others, are necessary and what the extent the treatment(s) should be. We wish to wait until after the proposed Acidification Training Session to work out the specific details of a soil treatment and the inclusion of this item into the reclamation cost estimate. In general, it is possible that after completion of our review of the Acidification Report that other minor modifications to the reclamation plan, and subsequently the reclamation cost estimate, may need to be made. (AAG)

The Division will suspend further review of this proposal until we receive a response to these comments. If you have any questions in this regard please contact me, Tom Munson, Tony Gallegos, or Lynn Kunzler of the Minerals Staff. If you wish to arrange a meeting to sit down and discuss this review, please contact us at your earliest convenience. Thank you for your cooperation in this permitting action.

Sincerely,



D. Wayne Hedberg  
Permit Supervisor  
Minerals Regulatory Program

jb  
cc: Mike Schwinn, ACOE  
John Whitehead, DWQ  
Lowell Braxton, DOGM  
KENNECOT.LMO